

Battery maintenance

See :

<https://maintenance-of-flooded-batteries.jimdosite.com/downloadable-documents/> or

See :

<https://sites.google.com/view/maintenanceoffloodedbatteries/downloadable-documents?pli=1>

Caution : Do not use the open-type adjustable current battery recharger without referring this document.

Caution : Open-type adjustable current battery recharger has to be used only after examining the continuity of the wires & examining the output electricity flow of each center-tapped iron-cored step-down transformers. There is risk of shock hazards which can be reduced or even prevented by using recent switches & recent sockets which have protruding plastic mold for covering the terminals. Use & solder singel-strand breadboard wires wherever necessary. A drop of general purpose glue such as Fevicol MR on each screw of the strip connector prevents the screws from loosening. Use a tubular glass fuse of 0.5 A to 1 A 240 volts for 11 iron-cored center-tapped transformers of each 12V-0-12V [*normal*] 1 Amps [*normal*].

Note : Slight tilt procedure & tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.

13 July 2022 is when i began to type this document. Initial typing done by author Niranjana Ambli.

Type or write this document to fill then save or scan this document before giving this document to the customers. Unfilled documents are free to be circulated electronically for preliminary information.

Date of filling the required information in this document :

1] Vehicle registration number :

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2] Battery collected from :

3] Name of the vehicle owner or even the driver :

4] Phone number of the vehicle owner or even the driver :

5] Number of tyres on ground :

6] Colour of the vehicle :

7] Vehicle manufacturing company :

8] Vehicle model name & variant :

9] Number of cylinders in the engine :

10] Manufacturing company of the battery :

11] Type of battery [*flooded, or VRLA*] :

12] Model number of the battery :

13] Serial number of the battery or last four digits of the serial number of the battery :

14] Date or Month of manufacturing of the battery as seen on the label :

15] OCV of the battery printed on the label after battery acid is filled in all six cells of the battery when the battery is in the battery manufacturing industry and is considered as new & unused :

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16] Ah capacity of the battery :

17] Place of recharging the vehicle's battery :

18] District :

19] State :

20] Country :

Any type of remarks made by the vehicle owner or even the driver =

- ☐ *Tick, if for example, time gap inbetween 1st piston stroke & 2nd piston stroke is more than successive constant gap, choose lower tabel option numbers.*
- ☐ *Tick, if for example, time period inbetween piston strokes decreases for a start therefore current recovery ability of the battery is getting revealed, conduct BMP without adding distilled water.*
- ☐ *Tick, if for example, conduct BMP without adding distilled water.*
- ☐ *Tick, if for example, conduct PBRP without adding distilled water.*
- ☐ *Tick, if for example, not to add distilled water to any of the cells of the battery.*
- ☐ *Tick, if for example, Malfunction Indicator Lamp [MIL] is ON, conduct BMP multiple times without adding distilled water.*

If other remark(s) =

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Usually before first engine start every day, disconnect the battery from the vehicle & use Current Regulator Circuit or Current Limiter Circuit as a testing circuit which has the following aspects, connect crocodile clip to one terminal of the battery at a time. [*Tabel created on 17 Nov 2023*]

Testing circuit for battery capacity	Resultant resistance value as the reference resistance. More resistance value choosen for a specific Ah capacity, slightly higher is the concentration of battery acid inbetween the battery plates	Relay winding resistance of a 12 volts relay. The relay which is fixed has poles vertical so that the gravitation force which acts on the poles is minimal.	Before first engine start for the day. Is Green LED ON	Before first engine start for the day. Is Red LED ON. If yes then there are chances that the battery has slightly more volumes of distilled water in the cells of the battery or the battery has slightly discharged.
For 44 Ah Batt which requires attention.	25 ohms	200 ohms		
For 44 Ah Batt when it is expected to be ok.	30 ohms	200 ohms		

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Notes [*section created on 15 July 2022, edited on 2 April 2023*]:

- 1] Horning has to be prevented for tens of seconds,
- 2] Headlight's primary filament, secondary filament & even its small bulbs should be prevented to be ON for few minutes when the engine is not running,
- 3] When stops are done near road junctions and near rail-road crossing, then use hand brake instead of foot brakes,
- 4] Delta hazard light [*sometimes used as parking light OR blinking light to attract attention during rains or fog*] or even side-light should not be switched ON for five minutes when the engine is not running,
- 5] Usually the vehicle's alternator is not allowed to recharge the vehicle's battery within a short time period inorder to prevent the risk of electrolysis. For slow battery recharging circuit, the vehicle's alternator may be connected to series resistor(s) & then a diode & then a capacitor & then a diode before connecting the terminals to the vehicle's battery. Pressing the accelerator of the vehicle will usually not allow the vehicle's battery to recharge within a short period of time because an arrangement is usually done inorder to prevent the risk of electrolysis. Jump-start is conducted inorder to ensure that the engine of the primary vehicle keeps on running & attempts to prevent issues for starting the engine of the primary vehicle just after jump-start is conducted, Conducting jump-start is risky because battery is not a simple machine.
- 6] Switching ON the blower for five minutes when the engine of the vehicle is not running should be prevented,
- 7] Switching ON the music system or even the radio for five minutes when the engine of the vehicle is not running should be prevented,
- 8] Switching ON any accessories or even by keeping ON any accessories at the time of starting the engine of the vehicle should be prevented. LED cabin light of low power rating may be used at the time of night,

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9] Do not keep the key at ACCESSORIES ON position for five minutes and do not use any accessories for five minutes when the engine of the vehicle is not running,

10] When the batteries are transported from the battery manufacturing industries, the threaded caps of the batteries are tightly screwed in order to prevent accidental spillage but when the batteries are installed in the vehicles, then the threaded caps of the batteries should be gently screwed in order to prevent the walls of the batteries to slightly bulge due to build-up of gas because of electrolysis. Plaster has to be used to cover the threaded caps of the batteries to prevent dust from entering the corners of the threaded caps of the batteries. Do not rely only on the gas vents of the batteries,

11] In coastal areas where there is high moisture content in the atmosphere, moisture resistant spray such as WD-40 sprayed on toilet tissue or petroleum jelly may be used to spread on the battery terminals in order to prevent corrosion of the battery terminals but in inland areas, the battery terminals have to be kept clean & dry after wiping with WD-40 sprayed on toilet tissue,

12] Use thick welding gloves to carry vehicle batteries which are heavy,

13] When the engine is shut-down just after running, then power steering, electrically assisted brakes or electro-mechanical assisted brakes wherein the brake fluid is used as a pressurized medium, and air conditioner circulation appears to remain ON for one or two seconds but will soon lose the power supply from engine's alternator,

14] When the battery is nearing its warranty period or even has crossed its warranty period then it may not be feasible to suddenly conduct Battery maintenance procedure or even Periodic battery recharge procedure because the battery plates would have been already chipped or even cracked due to build-up of increasing in concentration of battery acid in between the battery plates,

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15] For servicing, repairs & maintenance of engine's fuel injection system which includes injection timing assembly, spark plug(s) for petrol vehicles & glow plug(s) for diesel vehicles, it is necessary to visit the vehicle's authorized service center periodically. It is necessary to visit the vehicle's authorized service center periodically for servicing, repairs & maintenance of the fuel supply tubings, fuel pump, fuel filter, & fuel-air mixing system,

16] The cycle-life of vehicle's batteries should not be examined by using a vehicle outside the testing areas of the battery manufacturing industries or even the vehicle manufacturing industries, one of the reason is because during examining the cycle-life of the batteries, the vehicle batteries are usually discharged to such an extent that relevant indicators such as Malfunction Indicator Lamp [*MIL*] &/or Low battery indicator will remain ON in the instrument cluster of the vehicle or in the worst case, the engine of the vehicle will not start within a short time. During cycle-life testing, the concentration of battery acid inbetween the battery plates would have increased due to electrolysis,

17] When the vehicle batteries are filled with battery acid in the battery manufacturing industries, the vehicle's batteries are not sold as factory charged because as there is presence of battery acid in the battery, it is not required for the battery to be factory charged but while conducting tests in the battery manufacturing industries, short-time period recharge may be done inorder to examine the current recovery ability of the vehicle's batteries during the time of conducting experiment(s),

18] The current storage capacity in Ah of the battery & current recovery ability of the battery is difficult to be evaluated without using the engine of the vehicle mainly because the shorter length of ON time of starter motor shows that the battery is in good condition. Heavy electronic devices which are used to evaluate the current storage capacity in Ah of the battery or even the current recovery ability of the battery should not be used because at the time of testing by using heavy electronic devices, the

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battery which has to be evaluated will be risked to higher current consumption which may lead to low-resistive short-circuiting the battery,

19] By using battery for appropriate sized vehicle, the current recovery ability of the battery can be observed, if the time period inbetween the piston strokes of the engine decreases as the time passes at the time of starting the engine of the vehicle, then it can be considered that the current recovery ability of the battery is revealed. Current storage ability of the battery depends on current recovery ability of the battery,

20] If the vehicle has a punctured radial tyre then keeping the vehicle stationary for few weeks may reduce or even prevent the air from the tyre to escape but keeping the vehicle stationary for a month will result in the formation of stress cracks on the side of the tyre,

If the vehicle has a punctured radial tyre then keeping the vehicle stationary may reduce or even prevent the air from the tyre to escape,

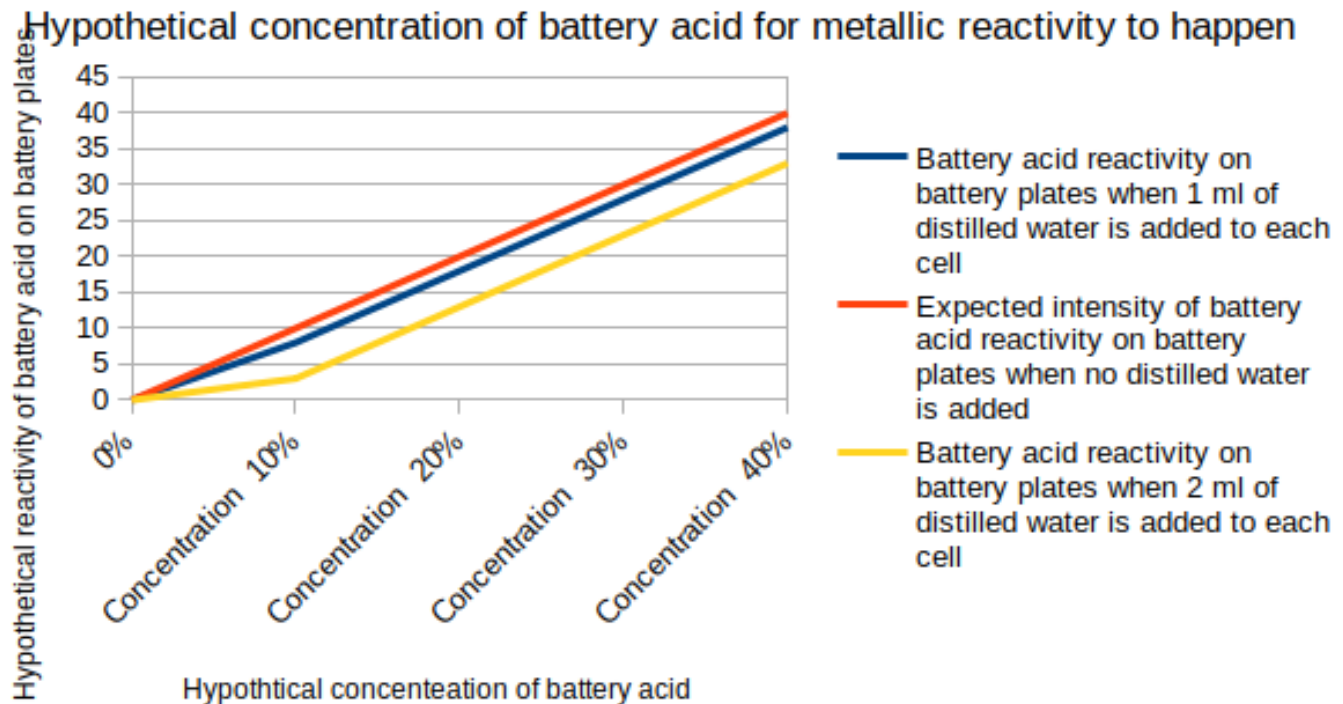
21] After filling air in the tyres, drop few drops of water by using a dropper or force in water by using a manual handheld sprayer or a syringe with needle to see whether air is being escaped from the valve of the tyres and then screw the valve caps,

22] Keep batteries away from direct sunlight inorder to prevent the plastic from becoming brittle.

As the vehicle's batteries are chemical reactive units which is expected to have maximum intensity of reactivity inbetween the battery plates & as there exists the aspect of hypothetical concentration of battery acid for metallic reactivity to happen therefore there does not exist 100 % battery recharging or even 90 % battery recharging, due to this reason, the current storage capacity of the vehicle's battery in Ampere Hours [Ah] cannot be expected to be or maintained at 100 % or even at 90 %.

Monochrome laser printers usually cannot print all colours as seen in the graph in the display of the computer therefore electronic copy of this unfilled document will be provided on request preferably by e-mail

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Some aspects to be considered [*Section created on 3 April 2023, edited on 17 May 2023*] :

- 1] Use distilled water to wash & toilet tissue to wipe laboratory glass apparatus, syringes, few centimeters submersible area of digital electrical conductivity meter, & plastic tray on which the battery is kept. Plastic tray is required to collect battery acid when there is accidental spillage which would result in the loss of battery acid,
- 2] Battery maintenance procedure has to be done once in six months from the date of manufacturing of the battery,
- 3] Usually during recharging the battery, battery tilt procedure & slight tilting of the battery has to be considered in order to prevent effects which would harm the battery plates & could affect the battery acid Absorbed Glass Mat [*AGM*] due to stagnation of concentrated battery acid, hydrogen bubbles, oxygen bubbles, & may be sulphur oxide bubbles, Battery tilt procedure will reveal whether electrolysis has happened,

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4] Periodic battery recharge procedure may be done once in six months, but Battery maintenance procedure has more priority,

5] Just for example, for a 44 Ah battery, its less risky to conduct battery maintenance procedure once in six months with 10 minutes recharge time after adding maximum of 0.3 ml of distilled water in each cell of the battery but its more risky to conduct battery maintenance procedure for once in a year with maximum of 20 minutes recharge time after adding maximum of 3.6 ml of distilled water in each cell of the battery, the reason is because as the battery acid from reservoir of each cells of the battery is not mixed & due to gradual electrolysis mainly at the time of discharging the battery when using the battery, the density of the battery acid & its concentration inbetween the battery plates would have increased, this would have already caused microscopic cracking to the set of battery plates in one or more than one cell of the battery.

In order to reduce confusion in deciding the recharge current, this document has two types of recharge current which are :

1] Exposed recharge current

The total resultant transformers norm current when the identical transformer's outputs are connected in parallel only after the diodes are connected.

Exposed recharge current can be considered to be maximum elevated-like recharge current.

Consider the sentence : "*The tinted glass is exposed to the Light of specific intensity*"

2] Flow-through recharge current

When the Exposed recharge current increases, the Flow-through recharge current also increases but usually cannot be plotted as a straight line in the graph.

Flow-through recharge current can be considered to be momentum-like recharge current

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Consider the sentence which is more practical : *“The tinted glass is exposed to the Light of specific intensity and light of lower intensity passes through the tinted glass”*

Choose tabel for Battery maintenance procedure, Periodic battery recharge procedure, and recharge procedure after conducting quick transferring of identical volumes of battery acid from each cells
dated 12 June 2022, edited on 10 Jan 2023 :

Caution : Choose option number 1 less frequently for large size batteries of two wheeler or even for three wheeler only for conducting Battery maintenance procedure,

Caution : Electrolysis happens with higher intensity in the third cell & in the fourth cell during the time of recharging & also during the time of discharging,

Caution : Storage capacity of the vehicle's battery in Ah starts adding from the third cell towards the first cell & from the fourth cell towards the sixth cell,

Caution : Current recovery ability of the vehicle's battery starts adding from the third cell towards the first cell & from the fourth cell towards the sixth cell,

Caution : Few volumes of battery acid from the battery acid reservoir will require waves of few days & waves of seven days to enter major areas inbetween the battery plates. After distilled water is added slightly more to the cell(s) of the battery, the current recovery ability of the battery will appear to be slightly less but is not harmed, the current recovery ability of the battery will gradually increase after few days because during the time of normal discharging process & by low power recharging process of the battery by using the alternator's power output, electrolysis process will again increase the battery acid concentration which is inbetween the battery plates, but for this condition to happen, the normal discharging process of the battery should be expected to be having more number of

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days, due to this reason, this condition becomes practically difficult to expect.

Caution : Gradually increase the decimal volume of distilled water which is added to only the 3rd cell & 4th cell of the Emergency battery which is used to start the engine of the vehicle after connecting in parallel with the battery which is fixed in the vehicle. For 44 Ah battery, use Current Regulator Circuit or Current Limiter Circuit as a testing circuit which has three series connected resistors of each quarter watts which has resultant resistance value of 30 ohms for adjustment of current output from LM 317 to supply power to the electromagnetic relay which has winding resistance of 200 ohms. Battery acid can be added to the beaker which has pipetted-out battery acid from the reservoir. Extra battery or spare battery should be considered different from Emergency battery,

Caution : In cold States and in cold Countries where there is presence of freezing climatic condition during winter season, do not add distilled water in any cell of the battery or beaker because due to freezing climatic condition, the reactivity of the battery acid on battery plates is expected to decrease.

Longer ON time of the starter motor has to be considered as approx 3 seconds by counting in the mind by thinking or saying “tick-tick one, tick-tick two, tick-tick three”. Slightly longer ON time of starter motor should be about two seconds. Number of attempts for starting the engine of the vehicle has to be only one attempt. If it becomes difficult in counting or if there is slightly longer ON time of starter motor even if the RPM of the starter motor increases after the engine starts then Battery maintenance procedure should only be conducted.

Conduct Battery maintenance procedure without adding distilled water if there are issues with power steering, if there are issues with electrically assisted brakes or electro-mechanical assisted brakes

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wherein the brake fluid is used as a pressurized medium, relevant indicators such as Malfunction Indicator Lamp [*MIL*] &/or low battery which remain ON in the instrument cluster.

If longer ON time of starter motor with or without the indicators which remain ON in instrument cluster, make written cover page which has preceding BMP, preceding PBRP, preceding qt and then conduct Battery maintenance procedure without adding distilled water.

When there is longer ON time of starter motor and the engine does not start, then it will require a month or even two months for conducting each Battery maintenance procedure every day in order to gradually mix the battery acid from the reservoir of each cells of the battery from above the set of battery plates to gradually attain approximately the same density or concentration of battery acid in the reservoir of each cells, & in order to gradually increase the current recovery ability of the battery, & in order to gradually increase the current storage ability of the battery. Do not press the accelerator or even the brakes of the vehicle. Do not attempt to steer the steering of the vehicle.

When there is longer ON time of starter motor and the engine does not start, then initially contact the authorized service center or companies helpline number to visit the place if there are any basic repairs which could be done but if there are other repairs then it's better to request for a tow-truck to take the vehicle to the authorized service center, OR if there are issues with the battery, then contact the battery helpline number to visit the place & to fix a new battery,

When the engine of the vehicle has started after conducting Battery maintenance procedure each day because there was presence of Longer ON time of starter motor & the engine was not starting, make written end of cover pages which has numbers of identical previous recharge procedures and attempt for succeeding recharge procedures. Do not

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press the accelerator or even the brakes of the vehicle. Do not attempt to steer the steering of the vehicle.

The attempt for succeeding recharge procedures consists of the following information :

A] BMP 0,0,0,0,0,0 . Tabel option number 0 . Recharge battery for 15 Minutes.

Max number of attempts until there is NO first slightly longer ON time of starter motor

= [*numbers of identical previous recharge procedures, keep counting same, do not change it*] / 2

B] BMP 0,0,0,0,0,0 . Tabel option number 0 . Recharge battery for 10 Minutes.

Max number of attempts until there is NO first slightly longer ON time of starter motor

= [*numbers of identical previous recharge procedures, keep counting same, do not change it*] / 2

C] BMP 0,0,0,0,0,0 . Tabel option number 0 . Recharge battery for 5 Minutes.

Max number of attempts until there is NO first slightly longer ON time of starter motor

= [*numbers of identical previous recharge procedures, keep counting same, do not change it*] / 2

After the pages which have attempt for succeeding recharge procedures, make written pages which is titled as “*Attempt for repetitive engine starts for this day*”, keep the battery connected in the vehicle with its base clamped for the whole day from early morning, during this time, make written page which has singel attempt to start the engine of the vehicle usually for once in every hour upto even once in every two hours and

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keep the engine of the vehicle running for about five minutes for each attempt after starting the engine of the vehicle. Do not make attempts to start the engine of the vehicle once in every 30 minutes. Do not make attempts to start the engine of the vehicle multiple times within 30 minutes. Do not press the accelerator or even the brakes of the vehicle. Do not attempt to steer the steering of the vehicle. At the end of the day, remove the battery from the vehicle & do 1 forward tilt & 1 backward tilt by holding the battery for 3 seconds for each approx 45 degree tilt, and notice whether bubbles get liberated.

After the pages which has “*Attempt for repetitive engine starts for this day*”, make a written page to conduct testing of side light, testing of delta hazard light, testing of rear brake light, testing of primary filament & secondary filament of head-light, testing of small bulb of head-light, testing of fog-lamps, gear testing [*driving on highway for about 4 minutes in each forward gear without pressing accelerator*], air conditioner testing [*driving on highway for about 4 minutes in 5th gear by slightly pressing accelerator*], radiator fan testing [*when ON, dont shutdown engine and after turning OFF, engine may be shutdown after about 30 seconds*] all in one day.

Other issues such as unexpected decrease in output power from accessories or even from lights of the vehicle can be noted.

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After adding distilled water to the 3rd cell & 4th cell, there is confusion in deciding the following which i have choosen for test-hypothetical in state :

Condition	Test-hypotesis for chemical reaction	Test-hypotesis for discharge due to inconsistency in hypothetical ionic polarity of battery acid
When 0.2 ml of distilled water is added to 3 rd cell & 4 th cell of 44 Ah battery	instant reaction would cause few ml to turn to bubbels & few ml to turn into slightly stabel chemical compound. Causes slightly longer ON time of starter motor for first engine start.	Slight loss of consistency in hypothetical ionic polarity which results in slight discharge of the battery. Causes slightly longer ON time of starter motor for first engine start.
	Theoretical nature of statements : low significance. May not be conclusive because it is distilled water which is added.	Theoretical nature of statements: Higher significance. May be conclusive
	Practical nature of statements : low significance.	Practical nature of statements : Higher significance.

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	May not be conclusive because it is distilled water which is added.	May be conclusive
	<p>Nature of statements are confused by :</p> <p>It requires waves of few days & waves of 7 days for few volumes of battery acid in the reservoir to enter major area inbetween the battery plates.</p>	<p>Nature of statements are confused by :</p> <p>It requires waves of few days & waves of 7 days for few volumes of battery acid in the reservoir to enter major area inbetween the battery plates.</p>

Begin choosing options from top to down for Battery maintenance procedure separately, for Periodic battery recharge procedure separately, and separately for recharge procedure after conducting quick transferring of identical volume of battery acid from each cells to neighboring cells because attempts can be made to examine the limits for adding distilled water. If time period between piston strokes decreases for a start then current recovery ability of the battery gets revealed. Changes were made to the following tabel because of the following reasons :

- 1] The battery acid from the reservoir does not gassify for new batteries but when the battery is about 2 years then the battery acid from the reservoir gassifies more intensively for the same appropriate exposed recharge current, therefore it became necessary to edit the following tabel.
- 2] Malfunction Indicator Lamp [*MIL*] does not turn OFF suddenly therefore it becomes necessary to edit the following tabel.
- 3] When the starter motor is ON to start the engine of the vehicle, I think that its less risky for an attempt to slightly increase the

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number of piston strokes by adding decimal volume of distilled water to the 3rd cell & 4th cell of the battery but is more risky to reduce the number of piston strokes which is equal to the number of cylinders after adding decimal volume of distilled water to all cells of the battery.

- 4] Few volumes of battery acid from battery acid reservoir will require waves of few days & waves of seven days to enter major areas inbetween the battery plates & Malfunction Indicator Lamp [*MIL*] does not stop glowing all of a sudden, one of the reason is because it would require many days for 10 minute recharge time period to electrolyse unit volume of distilled water if it is added to the 2nd cell & 5th cell of the battery & it will still require additional number of days for 10 minute recharge time period to electrolyse unit volume of distilled water if it is added to the 1 st cell & 6 th cell of the battery.
- 5] Each tabel option numbers are edited, one of the reason is because for my 44 Ah battery which had inappropriate decimal volume of distilled water in all cells, the next recharge was the addition of 0.2 ml of distilled water to only the 3rd cell & 4th cell of the battery along with mixing of battery acid from reservoir of each cells of the battery during BMP with 10 minutes of recharge time caused slightly longer ON time of starter motor for the first engine start for few days.
- 6] After considering that the addition of distilled water is to decrease the electrical conductivity inbetween the battery plates & after considering that the addition of battery acid is to increase the electrical conductivity inbetween the battery plates, therefore it becomes necessary to add decimal volumes of distilled water which is non reactive to only the 3rd cell & 4th cell of the battery at the time of conducting BMP and it may be necessary to add decimal volumes of battery acid which is reactive to only the

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beaker which has pipetted-out volumes of battery acid from the reservoir of cells of the battery at the time of conducting BMP.

- 7] Each label option numbers have to be appropriate to be chosen in frigid climatic conditions in areas during winter season & in permafrost areas when the batteries are recharged indoors in heated climatic condition. As the chemical reactivity of battery acid is expected to decrease slightly in freezing climatic conditions and as the battery acid inbetween the battery plates gasifies faster especially when the battery gradually becomes old, therefore there has to be only one way of adding distilled water to the chemical reactive system, that is, distilled water has to be added only to the 3rd cell & 4th cell of the battery for BMP which is considered to be of higher priority.
- 8] When current regulator circuit or current limiter circuit is used as a testing circuit, it becomes easier to monitor the current recovery ability which mainly includes from the 3rd cell & 4th cell of the battery, therefore the current storage ability of the battery can be evaluated in a much easier way.
- 9] After considering that the concentration or density of battery acid inbetween the battery plates for the 3rd cell & 4th cell is expected to be greater than the other cells & after considering that when the battery gradually becomes old then it becomes easier to hear that electrolysis is happening, therefore label option numbers for only the 3rd cell & 4th cell have to be emphasized on, this makes it possible to have a proper input way to add distilled water to the chemical reactive system.
- 10] For smaller size batteries, it is expected that there will be faster decrease in current storage capacity in Ah, current recovery ability & voltage if decimal volumes of distilled water is added to the 3rd cell & 4th cell of the battery but it is expected to increase gradually after battery maintenance procedure is done, therefore after considering these expectations, it is expected that distilled

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water has to be added to only the 3rd cell & 4th cell of the battery as an input way to the chemical reactive system.

11] The noted observation which was done by me on 2 Oct 2023 on current regulator circuit or current limiter circuit makes it necessary to give emphasis to only the 3rd cell & 4th cell, this makes it possible to have a proper input way to add distilled water to the chemical reactive system.

Gradually increase the Tabel option nu choosen	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
Option 0	-	—	-	-	-	-
Option 1	-	-	0.1	0.1	-	-
Option 2	-	-	0.2	0.2	-	-
Option 3	-	-	0.3	0.3	-	-
Option 4	-	-	0.4	0.4	-	-
Option 5	-	-	0.5	0.5	-	-
Option 6	-	-	0.6	0.6	-	-
Option 7	-	-	0.7	0.7	-	-
Option 8	-	-	0.8	0.8	-	-
Option 9	-	-	0.9	0.9	-	-
Option 10	-	-	1	1	-	-

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Note : I think that its better to think the word “*careful*” in a long way at the time of handling the laboratory apparatus & battery acid inorder to prevent unnecessary distractions & to keep the hypothetical dynamic memory brain cells to be refreshing with only one word.

Tabel option numbers were edited because for my vehicle which has 44 Ah battery, the following was evaluated by making a current regulator circuit or current limiter circuit which has an option of each resistor of 10 ohms quarter watt in series to get resultant resistance value of 30 ohms and which has another option of each resistor of 10 ohms quarter watt in assembly [*2 in series & 2 in parallel*] to get the resultant resistance value of 25 ohms, the following is expected :

Observation started on 2 Oct 2023.

Volume of distilled water added to 3 rd cell & 4 th cell for BMP.	Approx time taken for green light to turn ON for 25 ohms resultant resistor value & with 2 minutes daily engine running time.	Approx time taken for green light to turn ON for 30 ohms resultant resistor value & with 2 minutes daily engine running time.
0.2 ml	0 days	0 days
Next 0.4 ml	0 days	0 days
Next 0.6 ml	0 days	0 days

Note : I tried to find out howmany drops would make 1 ml by gluing a needel to the glass pipette of capacity 1 ml & by using a plastic syringe of capacity 2 ml, from the observations done, it would require 18 drops to 21 drops for 1 ml which would approx be 1.8 drops to 2.1 drops for 0.1 ml, consider approx 2 drops for 0.1 ml. If glass pipette of capacity 1 ml is not

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available in the market then use a plastic dropper or a glass dropper with rubber bulb.

Pipetting-out procedure followed for pipetting-out battery acid from each cells of the 44 Ah capacity flooded battery until above the set of battery plates and transferring it to the glass beaker of 1000 ml. The volumetric capacity of the glass pipette used can be of 10 ml capacity. The same pipetting-out procedure can be followed for other Ah capacity flooded batteries but for smaller Ah capacity flooded batteries such as of the two wheeler vehicles, use glass pipette which has lesser volumetric capacity :

Tabel created on : 23 Oct 2022,

Steps	Until above the set of battery plates	Notes
1	Pipette-out volumes of battery acid from cell nu 3 and transfer it to the glass beaker of 1000 ml capacity	If the battery plates are suddenly visible then press the rubber bulb of the pipette to force-out the volume of battery acid from the pipette, after this is done, transfer about one pipette volume from cell nu 1 to cell nu 3
2	Pipette-out volumes of battery acid from cell nu 2 and transfer it to the glass beaker of 1000 ml capacity	If the battery plates are suddenly visible then press the rubber bulb of the pipette to force-out the volume of battery acid from the pipette, after this is done, transfer about one pipette volume from cell nu 1 to cell nu 2
3	Pipette-out volumes of battery acid from cell nu 1 and transfer it to the glass beaker of 1000 ml capacity	If the battery plates are suddenly visible then press the rubber bulb of the pipette to force-out the volume of battery acid from the pipette, after this is done, transfer about one pipette volume from glass beaker to cell nu 1

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4	Pipette-out volumes of battery acid from cell nu 4 and transfer it to the glass beaker of 1000 ml capacity	If the battery plates are suddenly visible then press the rubber bulb of the pipette to force-out the volume of battery acid from the pipette, after this is done, transfer about one pipette volume from cell nu 6 to cell nu 4
5	Pipette-out volumes of battery acid from cell nu 5 and transfer it to the glass beaker of 1000 ml capacity	If the battery plates are suddenly visible then press the rubber bulb of the pipette to force-out the volume of battery acid from the pipette, after this is done, transfer about one pipette volume from cell nu 6 to cell nu 5
6	Pipette-out volumes of battery acid from cell nu 6 and transfer it to the glass beaker of 1000 ml capacity	If the battery plates are suddenly visible then press the rubber bulb of the pipette to force-out the volume of battery acid from the pipette, after this is done, transfer about one pipette volume from glass beaker to cell nu 6

Note : If the rubber bulb of the pipette gets holes in it or tears then make use of thick Polyethylene terephthalate [*PET*] bottel or even High-density polyethylene [*HDPE*] bottel. Directly apply Fevicol Probond edgefix adhesive from the metallic tube to stick the cap of the bottel to the glass pipette. Use Fevicol MR general purpose adhesive to stick the bottel cap to the bottel. Keep the glass pipette vertically with the plastic bottel on top. Its better to keep few numbers of glass pipettes.

Caution : The output of each transformer has to be connected in parallel only after diodes, after this, parallel electrolytic capacitor bank has to be used which has each capacitor voltage rated value of more than three times or even four times the transformers normal output voltage and each capacitor has to have the capacitance value of few thousands of

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microfarads so that the capacitors will not get damaged & can reduce output ripples from each transformer. Parallel electrolytic capacitor bank has to be used for an attempt to ease the electroplating process on the battery plates & to provide uniform density of electroplated layer on the battery plates. After the parallel electrolytic capacitor bank, many diodes have to be connected in parallel so that the resultant current value of all diodes should be slightly more than the resultant output normal current of all parallel connected transformers & then the output has to be connected to the battery terminals.

Caution : The Exposed recharge current which is appropriate to be used for a specific capacity rated battery should not exceed the minimum value of Exposed recharge current which is shown in the table because at higher Exposed recharge current values, it may become risky for the battery acid inbetween the battery plates to lose electrical properties when the battery acid inbetween the battery plates begins to heat-up & gasify. I think that if there is increase in temperature of battery acid inbetween the battery plates, the intensity of reactivity of battery acid inbetween the battery plates increases. I think that it is better to study the electrical properties of battery acid inbetween the battery plates but not to attempt to study what happens when the temperature of battery acid inbetween the battery plates begins to heat-up.

The below table has series assembly of 6 Volts 4 AH VRLA batteries or series & parallel assembly of 6 Volts 4 AH VRLA batteries along with appropriate values of Exposed Recharge Current [*total normal current of all transformers which are added*],

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6 Volts 4 AH VRLA batteries in series assembly or 6 Volts 4 AH VRLA batteries in series & parallel assembly.	Exposed Recharge Current [<i>total normal current of all transformers which are added</i>] used for 10 minute or 20 minute recharge.	Electrolysis happens for 10 minute recharge & even for 20 minute recharge by using identical general purpose unlabelled transformers
2 AH batts resultant capacity in series assembly	0.5 A .	Expected to be yes
4 AH batts resultant capacity in series & parallel assembly	1 A This current value can be maintained.	Expected to be yes
6 AH batts resultant capacity in series & parallel assembly	1.5 A.	Expected to be yes
8 AH batts resultant capacity in series & parallel assembly	2 A. This current value can be maintained.	Expected to be yes
10 AH batts resultant capacity in series & parallel assembly	2.5 A	Expected to be yes
12 AH batts resultant capacity in series & parallel assembly	3 A. This current value can be maintained.	Expected to be yes
14 AH batts resultant capacity in series &	3.5 A	Expected to be yes

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parallel assembly		
16 AH batts resultant capacity in series & parallel assembly	4 A This current value can be maintained.	Expected to be yes
18 AH batts resultant capacity in series & parallel assembly	4.5 A	Expected to be yes
20 AH batts resultant capacity in series & parallel assembly	5 A This current value can be maintained.	Expected to be yes
22 AH batts resultant capacity in series & parallel assembly	5.5 A	Expected to be yes
24 AH batts resultant capacity in series & parallel assembly	6 A This current value can be maintained.	Expected to be yes
26 AH batts resultant capacity in series & parallel assembly	6.5 A	Expected to be yes
28 AH batts resultant capacity in series & parallel assembly	7 A This current value can be maintained.	Expected to be yes
30 AH batts resultant capacity in series & parallel assembly	7.5 A	Expected to be yes
32 AH batts resultant capacity in series & parallel assembly	8 A This current value can be maintained.	Expected to be yes
34 AH batts resultant capacity in series &	8.5 A	Expected to be yes

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parallel assembly		
36 AH batts resultant capacity in series & parallel assembly	9 A This current value can be maintained.	Expected to be yes
38 AH batts resultant capacity in series & parallel assembly	9.5 A	Expected to be yes
40 AH batts resultant capacity in series & parallel assembly	10 A This current value can be maintained.	Expected to be yes
42 AH batts resultant capacity in series & parallel assembly	10.5 A	Expected to be yes
44 AH batts resultant capacity in series & parallel assembly	11 Amps.	Yes, it is examined & was noted for flooded vehicle battery during the time of experiment
Output of next array in parallel	Output of next array in parallel	Output of next array in parallel
46 AH batts resultant capacity in series & parallel assembly	11.5 A	Expected to be yes
48 AH batts resultant capacity in series & parallel assembly	12 A	Expected to be yes
50 AH batts resultant capacity in series & parallel assembly	12.5 A	Expected to be yes

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52 AH batts resultant capacity in series & parallel assembly	13 A	Expected to be yes
54 AH batts resultant capacity in series & parallel assembly	13.5 A	Expected to be yes
56 AH batts resultant capacity in series & parallel assembly	14 A	Expected to be yes
58 AH batts resultant capacity in series & parallel assembly	14.5 A	Expected to be yes
60 AH batts resultant capacity in series & parallel assembly	15 A	Expected to be yes
62 AH batts resultant capacity in series & parallel assembly	15.5 A	Expected to be yes
64 AH batts resultant capacity in series & parallel assembly	16 A	Expected to be yes
66 AH batts resultant capacity in series & parallel assembly	16.5 A	Expected to be yes
68 AH batts resultant capacity in series & parallel assembly	17 A	Expected to be yes
70 AH batts resultant capacity in series & parallel assembly	17.5 A	Expected to be yes

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72 AH batts resultant capacity in series & parallel assembly	18 A	Expected to be yes
74 AH batts resultant capacity in series & parallel assembly	18.5 A	Expected to be yes
76 AH batts resultant capacity in series & parallel assembly	19 A	Expected to be yes
78 AH batts resultant capacity in series & parallel assembly	19.5 A	Expected to be yes
80 AH batts resultant capacity in series & parallel assembly	20 A	Expected to be yes
82 AH batts resultant capacity in series & parallel assembly	20.5 A	Expected to be yes
84 AH batts resultant capacity in series & parallel assembly	21 A	Expected to be yes
86 AH batts resultant capacity in series & parallel assembly	21.5 A	Expected to be yes
88 AH batts resultant capacity in series & parallel assembly	22 A	Expected to be yes

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Tabel for recharge time period which may be appropriate for conducting Recharge procedures :

Recharge procedure	5 minutes recharge	10 minutes recharge	15 minutes recharge	20 minutes recharge
For BMP <i>[Higher priority]</i> Recommended for extra battery or spare battery and for emergency batteries	Rarely to be chosen for BMP for once in six months Not recommended for 2 minutes daily engine start time	Easy to remember it as a specific length of time period. Mostly to be chosen for BMP for once in six months	Somewhat alright to be chosen for BMP for once in six months	Try not choosing for BMP for once in six months
For PBRP <i>[Lower priority]</i>	Rarely to be chosen for once in six months Not recommended for 2 minutes daily engine start time	Easy to remember it as a specific length of time period Less frequently to be chosen for once in six months	Try not choosing for once in six months	Usually Not recommended

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For Quick transferring of identical volumes of battery acid from each cells To be done when it is difficult to conduct BMP for once in six months	Rarely to be choosen for once in six months Not recommende d for 2 minutes daily engine start time	Easy to remember it as a specific length of time period Less frequently to be choosen for once in six months	Try not choosing for once in six months	Try not choosing for once in six months
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Caution : As the reservoir of each cell in the battery is isolated, Periodic battery recharge procedure should not be conducted frequently one after another, in this case, its better to conduct Battery maintenance procedure once in six months.

Caution : One strange aspect about recharging the batteries is that sometimes just after stopping the recharging process of the battery, each cell in the battery tends to liberate bubbles much intensively when compared to the extent of bubbles liberated at the time of recharging process. Just after stopping the recharging process of the battery, during the time while conducting battery tilt procedure of each approx 45 degree tilt, bubbles get liberated much intensively from each cell of the battery.

Note : When the Emergency battery is new, the battery acid inbetween the battery plates gasifies slowly for the fixed amount of recharge time for example for 5 minutes recharge time with an Exposed recharge current of

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11 Amps for 44 Ah capacity battery but when the Emergency battery gradually becomes old after many months or even a year, the battery acid inbetween the battery plates gasifies a little faster for the fixed amount of recharge time for example for 5 minutes recharge time with an Exposed recharge current of 11 Amps for 44 Ah capacity battery, this proves that the electrical conductivity of battery acid inbetween the battery plates gradually increases with the increase in concentration of battery acid present inbetween the battery plates.

Note : Slight tilting the battery with atleast one second to hold the battery for each tilt during the time of recharging process and approx 45 degree tilting the battery with atleast one second to hold the battery for each tilt after the recharging process is as important as any recharging procedure for the battery because at the time of tilting the battery, the bubbels get liberated & the unstable battery acid reactiveness inbetween the battery plates gradually reduces, due to this reason, when the battery is tilted, then the battery's current storage capacity will gradually recover from bad condition & the current recovery ability of the battery will gradually recover from bad condition.

Caution : Do not try to change or replace the transformer(s) with other type in the open-type adjustable current battery recharger which has identical transformers. Note for battery recharging centers.

Caution : Recharging for once in six months for four wheeler batteries, do not frequently choose 5 minute recharge time because the thickness of the deposited electroplated layer on the battery plates is expected to be thin & brittle and therefore the density is expected to be non uniform or even less, AND Do not frequently choose 20 minute recharge time because the battery acid inbetween the battery plates will heat-up & will gasify, its risky to force the battery acid inbetween the battery plates turn to unstable reactive in state.

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Caution : The separating medium which is present inbetween the battery plates is usually considered as battery acid Absorbed Glass Mat [*AGM*], the *AGM* has liquid capillary ability which will allow the movement of battery acid from the reservoir to inbetween the battery plates and also from inbetween the battery plates to the reservoir but as the *AGM* fibers are mostly arranged in crossed linked, the *AGM* holds Hydrogen bubbels, Oxygen bubbels or even Sulphur oxide bubbels inbetween the battery plates. therefore Battery tilt procedure has to be conducted before the time of recharging procedure, after the time of recharging procedure and even for few times after few tens of minutes to few hours after writing the document for any Battery recharge procedure. The presence of *AGM* inbetween the battery plates is beneficial for electroplating to happen and therefore will reduce the risk for the formation of microscopic chipping & microscopic cracking of the battery plates.

Note : Conducting battery tilt procedure by holding the battery for atleast one second to few seconds for each approx 45 degree forward tilt & backward tilt should be considered as safe because the battery acid Absorbed Glass Mat [*AGM*] which is present inbetween the battery plates suddenly does not drain the absorbed battery acid from inbetween the battery plates at the time while conducting battery tilt procedure and as the air which is present above the battery acid reservoir is usually least reactive, the battery plates when exposed to the air above the battery acid reservoir at the time while conducting battery tilt procedure will not cause sudden corrosion of the exposed battery plates within few seconds. As the *AGM* which is present inbetween the battery plates has liquid capillary ability, the *AGM* retains the absorbed battery acid when battery tilt procedure is conducted by holding the battery for atleast one second to few seconds for each approx 45 degree forward tilt & backward tilt.

Caution : When the battery is being recharged, vibrator(s) should not be used to liberate bubbels from inbetween the battery plates because the

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use of vibrator(s) will cause vibrations to the battery acid Absorbed Glass Mat [AGM] which is present inbetween the battery plates, these vibrations may affect the formation of uniform density of electroplated layer on the battery plates

Caution : After recharging the vehicle's battery, the battery has to be kept disconnected for about 12 hours or even for about 18 hours because it would require many hours for the OCV of the battery to gradually reduce & to gain stability.

Caution : After recharging the vehicle's battery, the battery has to be kept disconnected for about 12 hours or even for about 18 hours because it would require many hours for the battery acid inbetween the battery plates to gradually reduce the unstable reactivity of the battery acid & to gain stable reactivity. It will require about 12 hours or even about 18 hours in order to liberate bubbles from inbetween the battery plates by conducting battery tilt procedures

Caution : After recharging the vehicle's battery by using appropriate exposed recharge current value for a specific Ah capacity battery, the battery has to be kept disconnected & idle for about 12 hours or 18 hours, but at the time of starting the engine of the vehicle usually the first start will appear that the battery is slightly discharged, this happens because at the time of recharging, few volumes of battery acid inbetween the battery plates is forced outwards due to heating but at the time when the battery is kept disconnected & idle, few volumes of battery acid from the surrounding of the battery plates & the reservoir will gradually enter inbetween the battery plates, this happens also at the time of conducting battery tilt procedure. Do not try to use slightly higher exposed recharge current by using labelled or unlabelled identical general purpose transformers.

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Caution : In frozen places during winter season, use few inches of plastic pipe and even plastic pipe fittings such as coupler or elbow or tee or cross-tee or reducer to scrape thin layers of ice on the terminals of the battery, a metallic washer can also be used, AND use tools from a pocket sized knife set to scrape ice from metallic fittings & flange type contacts for battery terminal contacts. Then use toilet tissue to wipe.

Caution : In places near / inside snow line or in places near / inside permafrost regions, Battery maintenance procedure by adding only least decimal volumes of distilled water as an option other than nothing has to be done inside heated environment in closed garage or heated environment indoors, If Battery maintenance procedure is not done then the concentration of battery acid inbetween the battery plates will increase, this makes the battery acid to achieve properties which appear to be similar to oily nature of liquids. When the battery acid loses watery flow liquid like properties and gains properties which appear to be similar to oily nature of liquids, the battery acid reveals the properties which appear to be similar to oily properties inside glass pipette at the time of forcing out the battery acid from the glass pipette. When the battery acid appears to gain oily nature of liquids then the capillary nature of the battery acid Absorbed Glass Mat [AGM] will get affected, that is the time when there will be gradual increase in the concentration of battery acid inbetween the battery plates, this condition is expected to cause microscopic chipping & microscopic cracking of the battery plates very fast and will risk the battery plates in the cell(s) of the battery to cause permanent damage overnight or will risk the battery plates in the cell(s) of the battery to cause sudden damage when riding or driving the vehicle. When the battery plates in the cell(s) are damaged, it is expected to mainly affect sequential ignition of the engine &/or electrical assisted brakes &/or electrical assisted power steering.

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Note : The calculation of density of battery acid is practically more straightforward by using digital devices & laboratory apparatus which are manufactured by using high accuracy & calibration because mathematically, the value of weight of battery acid in liquid state is divided by volume of battery acid in liquid state. It is expected that different acids have different electrical conductivity as the density of different acids is slightly increased gradually, therefore it becomes necessary for the digital device manufacturer to feed in the graph which has parameter value of electrical conductivity along with parameter value of acid concentration value to the electrical programmable memory of the digital devices which measures acid concentration of a specific acid because it becomes difficult to mathematically calculate the concentration value of a specific acid, but this process of calculation is usually not hypothetical or does not include hypothesis. The digital devices which measures acid concentration of a specific acid usually has operating range or response range which ranges from minimum acid concentration value which can be measured to maximum acid concentration value which can be measured. When the density of any acid increases two times then it is expected that the concentration value will increase more than two times, therefore a slight swing of density value is expected to give a large swing of concentration value.

Caution : Even if the engine of the vehicle is running, when the battery is discharged by horning for tens of seconds, then after few minutes or after few tens of minutes, the LED for Malfunction Indication Lamp [*MIL*] will turn ON, this will suddenly affect mainly sequential ignition of the engine &/or electrical assisted brakes &/or electrical assisted power steering. Remove the battery from the vehicle & conduct battery tilt procedure of usually ten times, wait for few tens of minutes & then start the engine of the vehicle, it is better to conduct Battery maintenance procedure as soon as possible. Do not try to increase the Exposed recharge current value for recharging specific Ah capacity battery. When the aspects in this caution

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are considered then battery recharging centers are necessary. LED indicator which displays Low battery is different from LED indicator which displays Malfunction Indication Lamp [*MIL*] in the instrument cluster in the dashboard.

Caution : Usually when the Malfunction Indicator Lamp [*MIL*] turns ON, the low battery indicator does not turn ON because the circuit for both are different even if both circuits are present on a single circuit board. The Malfunction Indicator Lamp [*MIL*] is expected to turn ON at specific voltage value & mainly at specific current value which is supplied to the switching electronic device such as an electromagnetic relay. The low battery indicator is expected to turn ON at specific voltage value & mainly at specific current value which is supplied to the switching electronic device such as an electromagnetic relay. It is expected that for each different models of vehicles, the voltage value & mainly the current value for these circuits is expected to be slightly different which is done by the vehicle manufacturers.

Caution : When it is considered that few volumes of battery acid in the battery acid reservoir will require waves of few days & waves of seven days to enter major areas inbetween the battery plates and when it is considered that the Malfunction Indicator Lamp [*MIL*] does not turn OFF even after conducting multiple Battery Maintenance Procedure with 10 minute recharge time without adding distilled water, therefore it is necessary to conduct successive recharge procedures after the issue(s) relating to the battery is solved, the successive recharge procedures have to be given higher priority on multiple BMP which are conducted one after another. If the successive recharge procedures are not conducted then there may be issues with power steering &/or there may be issues with electrical assisted brakes wherein the brake fluid is used as a pressurised medium &/or there may be issues with sequential ignition of the engine. How many number of times the BMP was done inorder to turn OFF the

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Malfunction Indicator Lamp [*MIL*], that many number of times successive BMP has to be done inorder to be away from the chances of the Malfunction Indicator Lamp [*MIL*] to turn ON suddenly on the road or even at the side of the road.

Caution : If engine is not started for atleast one month then remove the battery from the vehicle, tilt the battery for approx 45 degree forward & approx 45 degree backward by holding the battery for about 3 seconds for each tilt, follow this procedure for each minute seperated with a time gap of 1 minute for few times & then start the engine & for the next month, conduct battery maintenance procedure without adding distilled water in any cell(s) of the battery.

Caution : After starting the engine of the vehicle for few seconds to even for a minute if there are few unfrequent forced vibrations or even slow oscillation of slightly HIGH frequency vibrations & slightly LOW frequency vibrations usually with slight increase & slight decrease in the volume [*intensity*] during the time of sequential ignition which can be felt with less intensity when sitting inside the vehicle but can be felt with more intensity when the palm of the hand is kept inclined on the running engine then there is presence of slightly more volume of distilled water in the cell(s) of the battery or the battery is slightly discharged, during this condition, the current recovery ability of the battery is expected to fluctuate to slightly lesser value, this is also expected to fluctuate the current sorage capacity [*Ah*] of the battery to slightly lesser value.

Optional Caution : Slightly more volume of distilled water in the cell(s) of the battery would turn OFF the backlight of the infoaintement system for few seconds when the starter motor is ON because current recovery ability of the battery is expected to fluctuate to slightly lesser value, this is different from the condition when the backlight of the infoaintment system turns OFF for few seconds when the starter motor is ON for the

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unmaintained battery which gradually discharges after few months from the day of purchase.

Caution : When there is slightly more volume of distilled water in the cell(s) of the battery, then there is higher risk of longer ON time of starter motor at the time when an attempt is made to start the engine of the vehicle just after pressing the brake, this condition is risky on the busy lane of the road or even at the side of the road.

Caution : If slightly more volume of distilled water is added to the cell(s) of the battery, then the battery has to be used as a controlled electrolyser usually for multiple times while conducting multiple Battery Maintenance Procedure. Battery acid should not be removed out from the reservoir of the cells of the battery & transferred to an external electrolyser in order to increase the density or concentration of battery acid because as the amount of heat liberated by the battery acid in between a unit surface area of electrolyser plates & exposed current in between a unit surface area of electrolyser plates is expected to be more than the amount of heat liberated by the battery acid in between a unit surface area of battery plates & exposed current in between a unit surface area of battery plates, therefore it is expected that the battery acid in the external electrolyser is expected to lose electrical properties.

Note : Even if battery maintenance procedure is considered of higher priority & it is conducted once in six months, the engine of the vehicle may be started every day in order to inspect whether the sound of the fuel pump can be heard when the key position is in ACCESSORIES ON, to evaluate the way how the engine starts when the starter motor is ON, to evaluate whether there are unfrequent forced vibrations or even slow oscillation of slightly HIGH frequency vibrations & slightly LOW frequency vibrations usually with slight increase & slight decrease in the volume [*intensity*] during the time of sequential ignition, to evaluate the current

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storage capacity [Ah] of the battery & especially the hidden aspect of current recovery ability of the battery in order to choose minimum specific current storage capacity [Ah] of the battery for the appropriate vehicle.

Caution : Its rare to observe that the batteries OCV is more than the OCV which is printed on the label of the battery when the engine is not started for that day, if its more, then the battery acid Absorbed Glass Mat [AGM] is expected to trap bubbles in between the battery plates & the increasing density or concentration of battery acid in between the battery plates makes the capillary nature of battery acid Absorbed Glass Mat [AGM] less efficient, this is one of the reason why the OCV of the battery increases. If battery tilt procedure is not conducted in these rare condition then it is expected that the battery plates will get corroded more intensely & there will be formation of dots on the battery plates or even microscopic cracking of the battery plates would happen. There are chances that the digital multimeter's voltage measurement function has decreased its sensitivity for usually ten millivolts or rarely twenty millivolts, now in order to prevent the result of confusion which arises due to measurement errors, its better to set the rotatory switch to the next higher voltage for example from 20 VDC max to 200 VDC max. Anyway, the current storage ability of the battery in Ah & the hidden aspect of current recovery ability of the battery has to be emphasised on as it is required to start the engine of the vehicle. Its not necessary to purchase a new digital multimeter. OCV on the label of the battery & the serial number of the battery is printed by the battery manufacturing industry for registering the battery just after carefully filling each cells of the battery with battery acid, this process is expected to usually require few hours for four wheeler batteries & batteries for heavy vehicles but when the battery is out of the industry & is stored in storeroom or even in the showroom, its expected that the OCV of the battery will usually not be more than the printed OCV on the label of the battery. When the frequency of battery usage decreases but not the length of time period for using continuously for few

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minutes in the vehicle or even when the unmaintained battery gradually becomes old, its usually expected that the OCV of the battery will decrease.

Caution : Do not connect the probes of the digital multimeter to the battery terminals for measuring voltage at the time when the engine of the vehicle is running & during the time of shuttingdown the engine because there are chances of creating accuracy errors in the digital multimeter's voltage measuring function or even damaging the digital multimeter if there are DC pulsed ripples from rectified output from the alternator, in this case, use a low cost analog multimeter to measure voltage because usually the low cost analog multimeters are not expected to contain even transistors on its circuit board which could be damaged because of DC pulsed ripples. When properly handled, analog multimeters are usually much resistant against electrical damages when voltage such as DC pulsed rippled is measured & when flow-through current in DC pulsed rippled is measured. Begin rotating the rotatory switch of the analog multimeters from maximum value towards decreasing value if the parameter such as voltage or flow-through current which has to be measured is not known. The deflection of the pointer of analog multimeters works on electromagnetic properties in its surrounding winding coil therefore even if there is sudden ripples in change in voltage which has to be measured or flow-through current which has to be measured, the winding coil of the analog multimeters & the return spring will receive cushioning effect at the time during deflection of the pointer, due to this reason, analog multimeters are usually more resistant to electrical damages than digital multimeters. Even if there are errors in the digital multimeter while measuring voltage & flow-through current, it is expected that these errors are comparatively less than errors in the analog multimeter while measuring voltage & flow-through current.

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Note : If a battery was purchased which has different capacity in Ah other than the one which is fitted in the vehicle or if a battery which has opposite orientation of polarity is purchased then it can be used as an emergency battery but not as an extra battery or spare battery because other sizes of batteries usually cannot be clamped to the battery tray in the engine compartment. Emergency battery is different from extra battery or spare battery.

Caution : After conducting any recharge procedure, keep the battery disconnected for 12 hours to 18 hours during this time, conduct each battery tilt procedure separated with a time gap of tens of minutes to few hours for few times, now usually during the next day, for few hours before the battery is to be fixed in the vehicle, conduct single battery tilt procedure & then few slight tilts because when battery tilt procedure is conducted then few volumes of higher density or concentration of battery acid from inbetween the battery plates will be forced out to the surrounding battery acid reservoir along with liberation of bubbles from inbetween the battery plates, when this happens, few volumes of battery acid from the battery acid reservoir which is expected to have slightly lesser density or concentration will enter inbetween the battery plates, now wait for few hours & then fix the battery in the vehicle.

Caution : After considering that the batteries are chemical reactive system wherein there exist higher density or concentration of battery acid inbetween the battery plates, after considering that the hidden aspect of current recovery ability of the battery is expected to increase rapidly for new batteries & after considering that there does not exist aspect of 100 % battery recharging, therefore digital meters or even analog meters cannot be fixed to each cell of the battery in order to evaluate the appropriate volume of distilled water which has to be added to the cells of the battery, in order to evaluate the appropriate volume of extra battery acid which may be added to the beaker, in order to evaluate for how much time the battery has to be recharged & what should be the exposed

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recharge current, & in order to indicate when the battery has to be recharged.

Caution : After considering that few volumes of battery acid from battery acid reservoir will require weeks of few days & weeks of seven days to enter major areas in between the battery plates, after considering that Malfunction Indicator Lamp [*MIL*] does not stop glowing all of a sudden, after considering that the reactivity of battery acid is expected to decrease slightly in frigid climatic conditions & after considering that an arrangement is done in the vehicles in order to prevent recharging the battery to prevent electrolysis which would result the walls of the battery from bulging therefore it becomes necessary to neglect the idea on connecting low power dump-load by using filament bulbs such as 2 watts at the sides of the trucks & buses. Parallel connected white LED's of 5 mm on elongated circuit board for better light dispersion can be used instead of filament bulbs which is considered to be of concentrated light source. The idea on dump-load is for electronic circuits & electrical circuits which require mains power supply & less likely for power supply from generators or from inverters or from Uninterrupted Power Supply [*UPS*]. Filament type bulbs are good for dispersion of light from concentrated light source such as head light or search light or flood light. Concentrated light source is required when the light source available area is less & dispersed light source is required when the light source available area is more.

Note : Battery recharging centers are required when there is presence of a single Authorised Service Center which receives many models of vehicles for each day, these battery recharging centers can also be other than the vehicle's manufacturing company. The need of Battery recharging centers become necessary when the vehicle needs to be taken to the Authorised Service Center usually for once in a year usually

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for vehicle maintenance or repairs, this need would arise when the vehicle is about 6 years from the date of purchase.

Caution : Try not to start the engine of the vehicle 3 times within 30 minutes & to keep the engine running for only 2 minutes for each engine start because after 2 to 3 years from the date of fixing the battery, the Malfunction Indicator Lamp [*MIL*] is expected to turn ON & it does not turn OFF even after conducting few Battery Maintenance Procedure with 10 minute recharge time without adding distilled water.

Note : Disconnecting the battery from the vehicle is necessary to be done after the last engine shut-down for that day, this has to be done when the vehicle is used for conducting careful experiments. This step has to be done in order to evaluate no-load condition for the battery & in order to prevent accidental discharge of the battery if any accessory of the vehicle is accidentally kept ON or accidentally switched ON OR if any electricals of the vehicle is accidentally kept ON or accidentally switched ON.

Caution : When the battery is slightly discharged, the ignition sound & the time gap in between the piston strokes when the starter motor is ON mistakenly appears to be similar to the way how the engine starts when distilled water is present in slightly more volume in the cell(s) of the battery. Do not try to increase the exposed recharge current in any of these cases by using general purpose iron-cored center-tapped identical transformers because the sensitiveness of the battery acid in between the battery plates will lose its sensitivity towards appropriate exposed recharge current after choosing slightly higher exposed recharge current, this makes the battery acid in between the battery plates to lose electrical properties.

Caution : When it is considered that the battery warranty is 5 years & it is considered that the battery is a chemical reactive system then the

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recharging procedure can be decided after considering addition & deletion of few steps or remarks each year and at the end of 5 years, the acceptable recharge procedure can be decided. Do not try to increase the exposed recharge current by using general purpose iron-cored center-tapped identical transformers

Note : Keep a strip of marine grade plywood of thickness 6 mm & breadth of about 1 inch below heavy batteries so that it becomes easier to slightly tilt the batteries & also at the time when battery tilt procedure is conducted by tilting the battery to about 45 degrees forwards & backwards.

Caution : Keep a written label &/or a document which has volume of distilled water which is added to the cells of the battery for specifying it & for giving emphasis on the input way of adding distilled water to the chemical reactive system because first slightly longer ON time of starter motor is caused within 7 to 14 days if volume of distilled water is added to 1 st & 6 th cell OR 2 nd & 5 th cell OR 3 rd & 4 th cell of the battery. These conditions appear to be similar but would effect the current recovery ability of the battery which would also effect the current storage capacity of the battery in Ah. It may cause confusion in specifying the input way of adding distilled water to the chemical reactive system for making decision when the battery gradually becomes old, one of the reason is because the current recovery ability of the battery gets effected due to slightly more swing of battery acid concentration value or density inbetween the battery plates & the other reason would be that there would be formation of microscopic dots or microscopic chipping or microscopic cracking of the battery plates due to increasing of battery acid concentration value or density inbetween the battery plates.

Caution : Try not using the handle of the battery to lift the battery because if the handle breaks then the battery will fall on the ground, there are chances of the battery plates to chip-off or crack.

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Caution : Battery acid density or concentration buffering capacity of battery acid in each cell of the battery depends on the volume of battery acid in the reservoir of each cell of the battery.

Some aspects on experimentative testing circuit before Malfunction Indicator Lamp [*MIL*] turns ON :

- 1] When its considered that the current storage capacity of the battery in Ah is greater than the OCV of the battery & when its considered that the Malfunction Indicator Lamp [*MIL*] does not stop glowing all of a sudden, then its better to make a simple testing circuit which is current regulator circuit or current limiter circuit by using LM 317, this regulator provides power to the electromagnetc relay.
- 2] This testing circuit can be used in vehicles such as mine to turn ON the red LED before the vehicles Malfunction Indicator Lamp [*MIL*] turns ON.
- 3] On the enclosure of this testing circuit box, stick a label and write or print the vehicle registration number, the Ah capacity of the battery & the serial number of the battery.
- 4] This testing circuit supplies power to the electromagenetic relay but when slightly less power is supplied to the electromagenetic relay, then the electromagnetic relay can be used to turn OFF a green LED & will turn ON a red LED with or even without a buzzer.
- 5] Fix the electromagnetic relay so that the plates of the poles are vertical because the effect of gravitation force which acts on the plates of the poles of the electromagnetic relay can be reduced to minimal.
- 6] Do not use presets to carefully adjust the resistance value because slight adjustments by using presets will result in large variation of resistance value. Usually presets are of higher value for example 100 ohms which are available in the electronic stores.

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7] The winding of the industrial electromagnetic relay which i have used is of 12 volts 200 ohms which is labelled on it.

8] This testing circuit has to be connected to the fixed battery of the vehicle usually before the first engine start for the day, try not using any accessories of the vehicle before connecting & when this testing circuit is connected to the fixed battery.

9] This testing circuit has to have a sliding switch inorder to turn it OFF because the presence of an electromagnetic relay will gradually discharge the batteries within few hours if this testing circuit is kept ON, another option is to fix a push-button but sometimes if this testing circuit is necessary to be kept ON for lengthy time period then sliding switch is a much better option.

10] Initially for my 44 Ah battery, i had to connect two series resistors of 10 ohms quarter watt & then two parallel resistors of 10 ohms quarter watt to get the resultant resistance of 25 ohms. Add a sliding switch for resultant resistance of 30 ohms & for resultant resistance of 25 ohms. The resistance of relay winding is 200 ohms. If the battery is slightly discharged then red LED will turn ON for resultant resistance of 30 ohms.

11] Initially for my 44 Ah battery, when constructing this testing circuit by using bread board, it was necessary to leave about 12 to 18 hours after conducting BMP & then to adjust the resultant resistance value from higher resultant resistance value to lower resultant resistance value so that the electromagnetic relay will turn ON the green LED for resultant resistance of 30 ohms. More the resistance value choosen, there will be presence of slightly higher density or concentration of battery acid inbetween the battery plates.

12] Inorder to prevent damage to the circuit due to accidental reverse connection, i could not consider soldered diode because diodes have forward resistance value.

13] Its not necessary to connect a 21 watt bulb as a minimum test load with a push button because as this circuit is called as a current

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regulator circuit or current limiter circuit, the output current is adjusted by only using reference resistance value & if i had to connect a 21 watt bulb as a minimum test load, there would be chances of causing medium resistive short-circuiting the battery if its accidentally kept ON for few minutes.

14] This testing circuit has to be readjusted & relabelled each time when the new battery is fixed in the vehicle or secondary priority could be after or before fixing a new battery in the vehicle after conducting BMP which usually results in the number of piston strokes to be the same as the number of cylinders when the starter motor is ON.

15] Do not make resistance adjustments &/or replace the electromagnetic relay at the time when the engine is running & after the engine is shutdown. its better to leave the battery disconnected for 12 hours to 18 hours.

16] Try not to temporarily swapp or forever swapp the fixed battery of the vehicle with another one if this testing circuit is made & used in the vehicle.

17] Due to the presence of an electromagnetic relay & after considered that it requires 12 hours to 18 hours for the battery acid inbetween the battery plates to reduce unstable reactivity nature & to gain stable state after conducting battery recharging procedures, this testing circuit should not be connected to the battery just after conducting recharge procedures.

Note : Nowadays, when specific range of battery models are considered to be as maintenance free, its better not to add decimal volume(s) of distilled water to any cell(s) of the battery before recharging the battery.

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Form for Battery maintenance procedure : *Created on 13 July 2022, edited on 11 March 2024 :*

Slight tilt procedure & tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.

If longer ON time of starter motor with or without the indicators which remain ON in instrument cluster, make written cover page which has preceding BMP, preceding PBRP, preceding qt and then conduct Battery maintenance procedure without adding distilled water.

Note : Use a coin to loosely screw the threaded caps of the vehicle's battery & only to slightly tighten before battery tilt procedure is conducted :

Si nu	Step Type or write	Type or write	Notes
1	Disconnect the battery from the vehicle. If it is possible to remove the battery then remove it.		If there are ripples from the battery recharger then it may damage the electronics of the vehicle
2	OCV of the battery, Multimeter set to max :	OCV =	Norm OCV on label =
3	Screw the threaded caps		

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	of the battery with appropriate torque		
4	Washing the battery or wiping the battery		Washing the battery with only water, scrubber & cloth in order to remove dust, dirt, stains, oil, grease, & condensed vapours of battery acid
5	Unscrew the threaded caps of the battery		
6	Electrical conductivity of distilled water taken in glass beaker of 50 ml capacity	Microseconds per cm	Electrical conductivity meter device type = Pocket size pen type device, tick if YES = () Bench top device, tick if YES = () Enter multiplier value if it exists =
7	Volume of distilled water added to cells, refer options in tabel. Skip for VRLA batteries because there is absence of battery acid reservoir.	Tabel option nu =	if there are any negative feedbacks relating to longer ON time of starter motor without the engine starting, power steering, brakes, relevant indicators which remain ON in the instrument cluster, then make a written cover page which has preceding BMP, PBRP, qt and then conduct battery

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			maintenance procedure without adding distilled water.
8	Screw the threaded caps of the battery with appropriate torque	Usually skip	
9	Battery tilt procedure for every 10 seconds. For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.	Battery tilt procedure of usually 10 times. Number of approx 45 degree forward tilting = Number of approx 45 degree backward tilting = hold the battery for 3 seconds for each tilt	Did bubbles get liberated = Battery tilt procedure & slight tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.
10	Unscrew the threaded caps of the battery		
11	OCV of the battery, Multimeter set	OCV =	Norm OCV on label =

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	to max :		
12	<p>Pipette-out volumes of battery acid until slightly above the level of battery plates & transfer it to the glass beaker of 1000 ml capacity.</p> <p>Extra battery acid added to glass beaker = _____</p> <p>For VRLA batteries, skip this step because there is absence of battery acid reservoir</p>	<p>Wt of plastic sheet with empty glass beaker =</p> <p>Approx volume of battery acid in 1000 ml glass beaker =</p> <p>Wt of plastic sheet with filled glass beaker =</p> <p>Wt of battery acid =</p> <p>Divide by 6 & fill battery acid to each cell =</p>	<p>After distilled water is added or even extra battery acid is added, conduct battery tilt procedure of usually 10 times & slight tilt procedure of usually 10 times.</p> <p>Use digital weighing scale for accuracy,</p> <p>Use tare function of the digital weighing scale whenever necessary,</p> <p>The pumping function of the rubber bulb detachable type pipette can be used to mix the battery acid in the 1000 ml glass beaker.</p>
13	<p>Short-term recharge procedure.</p> <p>Recharging time has to be less than or equal to 20 minutes.</p>	<p>Short-term recharge procedure of minutes =</p> <p>For every 10 seconds, conduct live battery tilt procedure of 1 slight forward tilt</p>	<p>Exposed recharge current [<i>total normal current of all transformers which are added</i>] =</p> <p>Max Flow-through recharge current [<i>A max</i>] =</p> <p>Identical compact-sized labeled transformers [<i>yes or</i></p>

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		& 1 slight backward tilt without stopping battery recharging. Hold the battery for 3 seconds for each slight tilt.	<p><i>no</i>] =</p> <p>Identical general purpose labeled transformers [<i>yes or no</i>] =</p> <p>Identical general purpose unlabelled transformers [<i>yes or no</i>] =</p>
14	OCV of the battery, Multimeter set to max :	OCV =	Norm OCV on label =
15	Screw the threaded caps of the battery with appropriate torque	Usually skip.	If gasifying, then screw the threaded caps of the battery loosely because at the time of conducting battery tilt procedure, battery acid may come out from the side vents.
16	<p>Battery tilt procedure for every 10 seconds.</p> <p>For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.</p>	<p>Battery tilt procedure of usually 10 times.</p> <p>Number of approx 45 degree forward tilting =</p> <p>Number of approx 45 degree backward tilting =</p>	<p>Did bubbles get liberated =</p> <p>Battery tilt procedure & slight tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.</p>

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		hold the battery for 3 seconds for each tilt	
17	<p>Battery tilt procedure for an attempt to gradually reduce unstable reactivity of the battery acid inbetween the battery plates & to liberate bubbles from inbetween the battery plates</p> <p>For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.</p>	<p>Usually hold the battery for 3 seconds for each approx 45 degree tilt.</p> <p>Did bubbles get liberated in each attempt.</p> <p>If bubbles did not get liberated in the succeeding attempts then gradually reduce the seconds to hold the battery for each tilt until battery tilt procedure is stopped.</p>	<p>Did bubbles get liberated in each attempt.</p> <p>Wait for 1 minute, Attempt 1 = For each tilt, hold battery for seconds = 3</p> <p>Wait for 1 minute, Attempt 2 = For each tilt, hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 3 = For each tilt, hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 4 = For each tilt, hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 5 = For each tilt, hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 6 = For each tilt, hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 7 = For each tilt, hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 8 = For each tilt, hold battery for seconds =</p> <p>In approx 2 hours. with about 10 to 20 minutes time gap, battery tilt procedure should be conducted.</p>
18	Screw the		

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	threaded caps of the battery		
19	Stick wide tape on the threaded caps of the battery to cover the corners of the battery caps	For smaller batteries, also stick wide tape at the side of the batteries to write on it by using a marker pen.	By using a marker pen write the date on the plaster, BMP, Tabel option nu

Created on 2 Oct 2023, edited on 13 Jan 2024 :

For batteries upto 44 Ah along with this document =

For batteries upto 44 Ah for BMP form, page 1, page 2 & page 3 =

For batteries more than 44 Ah upto 88 Ah along with this document =

For batteries more than 44 Ah upto 88 Ah for BMP form, page 1, page 2 & page 3 =

if a commercial meter is required to be fixed in my house then i cannot consider this business as a daily and regular with board-title because the rent for the meter may be more than the profit.

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretively or accessed deceitfully.

Form for Periodic battery recharge procedure : Created on 16 July 2022, edited on 17 JAN 2024 :

Caution : Periodic battery recharge procedure should not be conducted frequently, that is, one recharge after another recharge for few times for Emergency batteries which are used to start the engine of the vehicle after connecting in parallel with the battery which is fixed in the vehicle. Periodic battery recharge procedure may be done once in six months, but BMP has more priority,

Slight tilt procedure & tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.

If longer ON time of starter motor with or without the indicators which remain ON in instrument cluster, make written cover page which has preceding BMP, preceding PBRP, preceding qt and then conduct Battery maintenance procedure without adding distilled water.

Note : Use a coin to loosely screw the threaded caps of the vehicle's battery & only to slightly tighten before battery tilt procedure is conducted :

Sl nu	Step Type or write	Type or write	Notes
1	Disconnect the battery from the vehicle. If it is possible to remove the battery then remove it.		If there are ripples from the battery recharger then it may damage the electronics of the vehicle

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2	OCV of the battery, Multimeter set to max :	OCV =	Norm OCV on label =
3	Unscrew the threaded caps of the battery		
4	Electrical conductivity of distilled water taken in glass beaker of 50 ml capacity	Microseconds per cm	<p>Electrical conductivity meter device type =</p> <p>Pocket size pen type device, tick if YES = ()</p> <p>Bench top device, tick if YES = ()</p> <p>Enter multiplier value if it exists =</p>
5	<p>Optional</p> <p>Volume of distilled water added to cells, refer options in tabel.</p> <p>Skip for VRLA batteries because there is</p>	<p>Tabel option nu</p> <p>=</p>	<p>if there are any negative feedbacks relating to longer ON time of starter motor without the engine starting, power steering, brakes, relevant indicators which remain ON in the instrument cluster, then make a written cover page which has preceding BMP, PBRP, qt and then conduct battery maintenance procedure without adding distilled water.</p>

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	absence of battery acid reservoir.		
6	Screw the threaded caps of the battery with appropriate torque	Usually skip.	
7	<p>Battery tilt procedure for every 10 seconds.</p> <p>For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.</p>	<p>Battery tilt procedure of usually 10 times.</p> <p>Number of approx 45 degree forward tilting =</p> <p>Number of approx 45 degree backward tilting =</p> <p>hold the battery for 3 seconds for each tilt</p>	<p>Did bubbles get liberated =</p> <p>Conduct slight tilt procedure of usually 10 times.</p> <p>Battery tilt procedure & slight tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.</p>
8	Unscrew the threaded caps of the		

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	battery		
9	OCV of the battery, Multimeter set to max :	OCV =	Norm OCV on label =
10	<p>Short-term recharge procedure.</p> <p>Recharging time has to be for 5 or 10 minutes Max because now the battery acid from the reservoir of each cells is not mixed and basically the reservoir of each cells is isolated.</p>	<p>Short-term recharge procedure of minutes =</p> <p>For every 10 seconds, conduct live battery tilt procedure of 1 slight forward tilt & 1 slight backward tilt without stopping battery recharging. Hold the battery for 3 seconds for each slight tilt.</p>	<p>Exposed recharge current [<i>total normal current of all transformers which are added</i>] =</p> <p>Max Flow-through recharge current [<i>A max</i>] =</p> <p>Identical compact-sized labeled transformers [<i>yes or no</i>] =</p> <p>Identical general purpose labeled transformers [<i>yes or no</i>] =</p> <p>Identical general purpose unlabelled transformers [<i>yes or no</i>] =</p>
11	OCV of the battery, Multimeter	OCV =	Norm OCV on label =

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	set to max :		
12	Screw the threaded caps of the battery with appropriate torque	Usually skip.	If gasifying, then screw the threaded caps of the battery loosely because at the time of conducting battery tilt procedure, battery acid may come out from the side vents.
13	<p>Battery tilt procedure for every 10 seconds.</p> <p>For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.</p>	<p>Battery tilt procedure for usually 10 times.</p> <p>Number of approx 45 degree forward tilting =</p> <p>Number of approx 45 degree backward tilting =</p> <p>hold the battery for 3 seconds for each tilt</p>	<p>Did bubbles get liberated =</p> <p>Conduct few slight tilt procedure.</p> <p>Battery tilt procedure & slight tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.</p>
14	Battery tilt procedure for an attempt to gradually	Usually hold the battery for 3 seconds for each approx 45	<p>Did bubbles get liberated in each attempt.</p> <p>Wait for 1 minute, Attempt 1 =</p> <p>Hold battery for seconds =</p>

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	<p>reduce unstable reactivity of the battery acid inbetween the battery plates & to liberate bubbles inbetween the battery plates</p> <p>For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.</p>	<p>degree tilt.</p> <p>Did bubbles get liberated in each attempt.</p> <p>If bubbles did not get liberated in the succeeding attempts then gradually reduce the seconds to hold the battery for each tilt procedure until battery tilt procedure is stopped.</p>	<p>Wait for 1 minute, Attempt 2 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 3 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 4 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 5 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 6 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 7 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 8 = Hold battery for seconds =</p> <p>In approx 2 hours. with about 10 to 20 minutes time gap, battery tilt procedure should be conducted.</p>
15	Screw the threaded caps of the battery		
16	Stick wide tape on the threaded caps of the battery to cover the corners of the battery	For smaller batteries, also stick wide tape at the side of the batteries to write on it by using a marker pen.	By using a marker pen write the date on the plaster, PBRP, Tabel option nu

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	caps		
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Created on 13 Jan 2024 :

For batteries upto 44 Ah along with this document =

For batteries upto 44 Ah for PBRP form, page 1, page 2 & page 3 =

For batteries more than 44 Ah upto 88 Ah along with this document =

For batteries more than 44 Ah upto 88 Ah for PBRP form, page 1, page 2 & page 3 =

if a commercial meter is required to be fixed in my house then i cannot consider this business as a daily and regular with board-title because the rent for the meter may be more than the profit.

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Form for recharge procedure after conducting quick transferring of identical volume of battery acid from each cells when there are conditions which make it difficult to conduct Battery maintenance procedure or even Periodic battery recharge procedure.

Created on 7 Sep 2022,

edited on 30 July 2024

Battery tilt procedure & slight tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.

If longer ON time of starter motor without the engine starting & with or without the indicators which remain ON in instrument cluster, make written cover page which has preceding BMP, preceding PBRP, preceding qt and then conduct Battery maintenance procedure without adding distilled water.

Note : Use a coin to loosely screw the threaded caps of the vehicle's battery & only to slightly tighten before battery tilt procedure is conducted

Sl nu	Step Type or write	Type or write	Notes
1	Disconnect the battery from the vehicle.		Ripples from the battery recharger may damage the electronics of the vehicle
2	OCV of the battery, Multimeter set to max :	OCV =	Norm OCV on label =
3	Unscrew the threaded caps of the battery		
4	Electrical conductivity of		Electrical conductivity meter device type =

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretly or accessed deceitfully.

	distilled water taken in glass beaker of 50 ml capacity	microseconds per cm	Pocket size pen type device, tick if YES = () Bench top device, tick if YES = () Enter multiplier value if it exists =
5	Volume of distilled water added to cells, refer options in tabel. Skip for VRLA batteries because there is absence of battery acid reservoir.	Tabel option nu =	if there are any negative feedbacks relating to longer ON time of starter motor without the engine starting, power steering, brakes, relevant indicators which remain ON in the instrument cluster, then make a written cover page which has preceding BMP, PBRP, qt and then conduct battery maintenance procedure without adding distilled water if its possible to be done
6	From cell nu 3 to 2 From cell nu 2 to 1 From cell nu 1 to 2 From cell nu 2 to 3 From cell nu 4	Volume = Volume = Volume = Volume =	At a time, transfer identical volume of battery acid to the neighboring cell Glass beaker of 50 ml capacity & 100 ml capacity will be beneficial Use glass funnel to carefully transfer battery acid to each cell.

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	<p>to 5</p> <p>From cell nu 5 to 6</p> <p>From cell nu 6 to 5</p> <p>From cell nu 5 to 4</p>	<p>Volume =</p> <p>Volume =</p> <p>Volume =</p> <p>Volume =</p>	<p>Conduct battery tilt procedure of usually 10 times.</p> <p>Conduct slight tilt procedures of usually 10 times.</p>
7	<p>Short-term recharge procedure.</p> <p>Recharging time has to be less than or equal to 20 minutes.</p>	<p>Short-term recharge procedure of minutes =</p> <p>For every 10 seconds conduct live battery tilt procedure of 1 slight forward tilt & 1 slight backward tilt without stopping battery recharging. Hold the battery for 3 seconds for each slight tilt.</p> <p>See whether it is possible to be done</p>	<p>Exposed recharge current [<i>total normal current of all transformers which are added</i>] =</p> <p>Max Flow-through recharge current [<i>A max</i>] =</p> <p>Identical compact-sized labeled transformers [<i>yes or no</i>] =</p> <p>Identical general purpose labeled transformers [<i>yes or no</i>] =</p> <p>Identical general purpose unlabelled transformers [<i>yes or no</i>] =</p>
8	OCV of the battery,	OCV =	Norm OCV on label =

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	Multimeter set to max :		
9	<p>Slightly screw the caps. If possible then conduct: Battery tilt procedure for usually 10 times.</p> <p>For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.</p>	<p>Number of approx 45 degree forward tilting =</p> <p>Number of approx 45 degree backward tilting =</p> <p>hold the battery for 3 seconds for each tilt</p>	<p>If gasifying, then screw the threaded caps of the battery loosely because at the time of conducting battery tilt procedure, battery acid may come out from the side vents.</p> <p>Did bubbles get liberated =</p> <p>If possible then conduct: slight tilt procedure for usually 10 times.</p> <p>Battery tilt procedure & slight tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.</p>
10	If possible then conduct battery tilt procedure for an attempt to gradually reduce unstable reactivity of the battery acid inbetween the	<p>Usually hold the battery for 3 seconds for each approx 45 degree tilt.</p> <p>Did bubbles get liberated in each attempt.</p>	<p>Did bubbles get liberated in each attempt.</p> <p>Wait for 1 minute, Attempt 1 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 2 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 3 = Hold battery for seconds =</p> <p>Wait for 1 minute, Attempt 4 = Hold battery for seconds =</p>

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretly or accessed deceitfully.

	battery plates & to liberate bubbles from inbetween the battery plates For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.	If bubbles did not get liberated in the succeeding attempts then gradually reduce the seconds to hold the battery for each tilt procedure until battery tilt procedure is stopped.	Wait for 1 minute, Attempt 5 = Hold battery for seconds = Wait for 1 minute, Attempt 6 = Hold battery for seconds = Wait for 1 minute, Attempt 7 = Hold battery for seconds = Wait for 1 minute, Attempt 8 = Hold battery for seconds = In approx 2 hours. with about 10 to 20 minutes time gap, battery tilt procedure should be conducted.
11	Screw the threaded caps of the battery		
12	Stick wide tape on the threaded caps of the battery to cover the corners of the battery caps	For smaller batteries, also stick wide tape at the side of the batteries to write on it by using a marker pen.	By using a marker pen write the date on the plaster, qt, Tabel option nu

Created on 14 Jan 2024 :

For batteries upto 44 Ah along with this document =

For batteries upto 44 Ah for Quick transfer form, page 1, page 2 & page 3 =

For batteries more than 44 Ah upto 88 Ah along with this document =

For batteries more than 44 Ah upto 88 Ah for Quick transfer form, page 1, page 2 & page 3 =

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretly or accessed deceitfully.

if a commercial meter is required to be fixed in my house then i cannot consider this business as a daily and regular with board-title because the rent for the meter may be more than the profit.

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Temporary notes for deleting form for Quick mixing for mixing of pipetted-out battery acid from above the set of battery plates from each cells of the Emergency battery because when few volumes of battery acid is transferred from one cell to the other cell, it is expected that there will be more number of piston strokes when the starter motor is ON.

For the battery for my vehicle, i had transferred few ml of battery acid from one cell to another cell after conducting BMP with 10 minutes recharge time without adding distilled water & the next day i obseved that there was 6 piston strokes when the starter motor is ON, this is why i had to delete this form.

After the battery is recharged, the battery acid inbetween the battery plates & the battery acid reservoir is expected to achieve hypothetical electrical ionic polarity which has hypothetical positive ionic charge slightly more than hypothetical negative ionic charge or slightly less than hypothetical negative ionic charge but not the same because there is no middel cell of the battery. Due to this reason when few volumes of battery acid is transferred from one cell to the other cell after BMP, it is expeted that there will be more number of piston strokes when the starter motor is ON.

This form is an example of test-hypothetical case which is expected to give unexpected results at the time when starter motor is ON after conducting BMP.

When this form is expected to give unexpected results then this form will be in imaginative in state after expecting that it will give unexpected results when this form is in test-hypothetical in state.

Either this form is in test-hypothetical in state or either this form is in imaginative in state, this form may not be beneficial for practicals, but this statement cannot be concluded easily by me.

After considering all of the following statements, it was not possible to delete this form, therefore i had to consider this form as Temporary undeleted form :

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1] Cause = Due to battery tilt procedure, the movement of few volume of battery acid from inbetween the battery plates to the reservoir & from the reservoir to inbetween the battery plates.

2] Cause = When battery is recharged then few volume of battery acid inbetween the battery plates is forced out to the reservoir & just after recharging, few volume of battery acid from the reservoir will move inbetween the battery plates.

3] Cause = After considering that few volumes of battery acid in the battery acid reservoir will require waves of few days & waves of seven days to enter major areas inbetween the battery plates.

Deleting this form is the result why heavy batteries should not be purchased because maintenance cannot be done easily & it is necessary to connect batteries in parallel to get the resultant current capacity of the batteries in Ah, typing or saying this sentence is very easy but it is very difficult for the vehicle manufacturers to make space available in order to connect two batteries in parallel under the front engine compartment cover for four wheelers and to make space available in order to connect atleast two batteries in parallel for four wheelers & for heavy vehicles.

Study on battery bank along with individual exposed-recharge current with individual BMP conducted is necessary. The recharge procedure which has quick transferring of identical volume of battery acid to neighbouring cells is also necessary to be done because it is difficult to conduct BMP & tilt procedure for heavy batteries.

The need for battery bank may become necessary in vehicles which are in frigid climatic conditions during winter season & for vehicles which are kept indoors in permafrost climatic conditions.

When making a battery bank, the conditions which result in accidental short-circuit should be prevented.

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretly or accessed deceitfully.

Temporary undeleted form for quick mixing of pipetted-out battery acid from above the set of battery plates from each cells of the Emergency battery after mistakenly conducting frequently one after another Periodic battery recharge procedure for Emergency battery but at the same time there are conditions or even no time which makes it difficult to conduct Battery maintenance procedure for Emergency battery :

Battery tilt procedure & slight tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.

Created on 4 Oct 2022, edited on 15 JAN 2024

Note : Use a coin to loosely screw the threaded caps of the vehicle's battery & only to slightly tighten before battery tilt procedure is conducted

Sl nu	Step Type or write	Type or write	Notes
1	Unscrew the threaded caps of the battery		
2	Pipette-out volumes of battery acid until slightly above the level of battery plates & transfer it to the glass beaker of 1000 ml capacity.	Wt of plastic sheet with empty glass beaker = Approx volume of battery acid in 1000 ml glass beaker =	Use digital weighing scale for accuracy, Use tare function of the digital weighing scale whenever necessary, The pumping function of the rubber bulb detachable type pipette can be used to mix the battery acid in the 1000 ml

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	For VRLA batteries, skip this step because there is absence of battery acid reservoir	Wt of plastic sheet with filled glass beaker = Wt of battery acid = Divide by 6 & fill battery acid to each cell =	glass beaker.
3	If possible then conduct: Battery tilt procedure of usually 10 times. For VRLA batteries, skip Battery tilt procedure because there is absence of battery acid reservoir.	Conduct slight tilt procedure of usually 10 times. Number of approx 45 degree forward tilting = Number of approx 45 degree backward tilting = hold the battery for 3 seconds for each tilt	Did bubbles get liberated = Battery tilt procedure & slight tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.
4	Screw the threaded caps of the battery		

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretly or accessed deceitfully.

	with appropriate torque		
5	Stick wide tape on the threaded caps of the battery to cover the corners of the battery caps	For smaller batteries, also stick wide tape at the side of the batteries to write on it by using a marker pen.	By using a marker pen write the date on the plaster, qm

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretly or accessed deceitfully.

Form for an attempt to calculate the approx density of battery acid for 1 ml of battery acid from the battery by using glass burette. It may not be necessary to conduct this test once in six months or even once in a year :

This procedure has to be conducted only before BMP is conducted.

Created on : 9 Nov 2022, edited on 2 April 2023

Sl nu	Steps Type or write	Type or write	Notes
1	Unscrew the threaded caps of the battery		
2	<p>Pipette-out volumes of battery acid until slightly above the level of battery plates & transfer it to the glass beaker of 1000 ml capacity.</p> <p>For VRLA batteries, skip this step because there is absence of battery acid reservoir</p>	<p>Wt of plastic sheet with empty glass beaker =</p> <p>Approx volume of battery acid in 1000 ml glass beaker =</p> <p>Wt of plastic sheet with filled glass beaker =</p> <p>Wt of battery acid =</p>	<p>Use digital weighing scale for accuracy,</p> <p>Use tare function of the digital weighing scale whenever necessary,</p> <p>The pumping function of the rubber bulb detachable type pipette can be used to mix the battery acid in the 1000 ml glass beaker.</p>

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3	<p>Fill the glass burette with battery acid upto 50 ml graduations for small size burette or 100 ml graduations for large size burette.</p> <p>Keep glass funnel on top of glass burette at the time of filling battery acid.</p>	<p>Volume of battery acid transferred from glass burette to glass beaker =</p> <p>Wt of battery acid in glass beaker =</p> <p>Approx density of battery acid for 1 ml of battery acid by calculating : grams / volume =</p>	<p>Use digital weighing scale for accuracy,</p> <p>Use tare function of the digital weighing scale whenever necessary,</p>
4	Transfer all volumes of battery acid to one glass beaker	Divide weight of the battery acid by 6 & fill battery acid to each cell =	<p>Conduct battery tilt procedure for usually few times.</p> <p>Conduct slight tilt procedure for usually few times.</p>
5	Screw the threaded caps of the battery with appropriate torque		
6	Stick wide tape on the threaded caps of the battery	For smaller batteries, also stick wide tape at the side of the batteries to write on it	By using a marker pen write the date on the plaster & density of battery acid.

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretly or accessed deceitfully.

	to cover the corners of the battery caps	by using a marker pen.	
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Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretively or accessed deceitfully.

For the battery acid contained in the bottel from the market, this is a form for an attempt to calculate the approx density of battery acid for 1 ml of battery acid by using glass burette.

Created on : 12 Nov 2022, edited on 2 April 2023

Sl nu	Steps Type or write	Type or write	Notes
1	Manufacturer of the battery acid		
2	Date of manufacturing battery acid OR date of packaging of battery acid as printed on the label of the bottel	Date =	
3	Date of purchasing battery acid from market	Date =	
4	Fill the glass burette with battery acid upto 50 ml graduations for small size burette or 100 ml graduations for large size burette.	Wt of plastic sheet with empty glass beaker = Volume of battery acid transferred from glass burette to glass beaker = Wt of plastic sheet with filled glass beaker =	Use digital weighing scale for accuracy, Use tare function of the digital weighing scale whenever necessary,

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretively or accessed deceitfully.

	Keep glass funnel on top of glass burette at the time of filling battery acid.	Wt of battery acid in glass beaker = Approx density of battery acid for 1 ml of battery acid by calculating : grams / volume =	
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Caution : Battery acid can be added to the glass beaker after pipetting-out battery acid from the reservoir at the time of conducting Battery Maintenance Procedure. Even if the density of battery acid in battery is same as the density of battery acid in the battery acid bottle from market, do not add battery acid of more than 0.5 ml for higher capacity Ah batteries of two & three wheelers and not more than 1 ml for four wheelers to prevent risk of slightly longer ON time of starter motor.

Caution : When the aspect of battery acid in the battery acid reservoir will require waves of few days & waves of seven days to enter major areas inbetween the battery plates is considered, when the aspect of recharging the battery involves electroplating process is considered, when the aspect of addition of extra volumes of battery acid is only to increase the electrical conductivity inbetween the battery plates is considered and when the aspect of reactivity of battery acid is expected to decrease as temperature decreases is considered, then do not add extra decimal volumes of battery acid to beaker in places which are frozen during winter season.

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Form for starting the engine of the vehicle after keeping the vehicle idle for atleast a month. If engine is not started for atleast a month then follow the same procedure & then conduct Battery Maintenance Procedure without adding distilled water in any cell(s) of the battery. Emergency battery can be connected in parallel with the battery which is fixed in the vehicle inorder to start the engine of the vehicle. When emergency battery is used then type or write the resultant OCV of the batteries when connected in parallel with the battery which is fixed in the vehicle.

This form may be beneficial to evaluate the current storage capacity [Ah] of the battery & especially the hidden aspect of current recovery ability of the battery inorder to choose minimum specific current storage capacity [Ah] of the battery for the appropriate vehicle.

This form may be beneficial to start the engine of the vehicle if an undersized battery which has slightly lesser current storage capacity [Ah] is used.

This form may be beneficial to start the engine of the vehicle which are idle usually for atleast a month in cold areas outside the snow line during summer season & passed the snow line during winter season in indoor areas which have heated climatic condition.

Procedure created on : 1 July 2023.

1] Disconnect the battery from the vehicle. If its possible to remove the battery then remove it.

2] OCV of the battery. Multimeter set to max : OCV =
OR

When emergency battery is used then type or write the resultant OCV of the batteries when connected in parallel with the battery which is fixed in the vehicle

Resultant OCV of the batteries. Multimeter set to max : OCV =

3] Battery tilt procedure :

Note at the footer: No guarantee, and no guarantee if the battery is wrongly handled or wrongly maintained or wrongly touched or wrongly misused or accessed secretively or accessed deceitfully.

For VRLA batteries skip battery tilt procedure because there is absence of battery acid reservoir.

Slight tilt procedure & tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery

Try to conduct the following procedure for each minute seperated with a gap of 1 minute for few times.

Nu of approx 45 degree forward tilting :

Nu of approx 45 degree backward tilting :

Hold the battery for three seconds for each tilt.

Did bubbels get liberated =

4] Wait for about 10 minutes for a time gap.

Enter or write the time gap which is left =

5] Battery tilt procedure

For VRLA batteries skip battery tilt procedure because there is absence of battery acid reservoir.

Slight tilt procedure & tilt procedure are beneficial & is possible to be done with less effort for the batteries which has battery plates parallel to the left side & right side of the battery.

Try to conduct the following procedure for each minute seperated with a gap of 1 minute for few times.

Nu of approx 45 degree forward tilting :

Nu of approx 45 degree backward tilting :

Hold the battery for three seconds for each tilt.

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Did bubbles get liberated =

6] OCV of the battery. Multimeter set to max : OCV =

OR

When emergency battery is used then type or write the resultant OCV of the batteries when connected in parallel with the battery which is fixed in the vehicle

Resultant OCV of the batteries. Multimeter set to max : OCV =

7] Connect the battery to the vehicle.

8] Do not attempt to start the engine of the vehicle.

Ensure that the gears are in neutral.

Do not use any accessory of the vehicle.

Do not press the clutch, brake, accelerator & do not steer the steering of the vehicle.

Do not switch ON any electricals of the vehicle.

Insert the key & keep the key in ACCESSORIES ON position for 1 minute, during this time few relays will turn ON & OFF, the fuel pump will turn ON & OFF.

Was it possible to hear the sound of the fuel pump [*note that the location of the fuel pump for few models of vehicles makes it possible to hear the sound of the fuel pump*] =

After 1 minute, remove the key.

9] Disconnect the battery from the vehicle.

10] Wait for about 10 minutes for a time gap.

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Enter or write the time gap which is left =

11] OCV of the battery appears to decrease in milli volts but there are chances of slightly increasing the current recovery ability of the battery by attempting to slightly increase the reactivity of the battery acid inbetween the battery plates in one of the previous step when the battery was used for 1 minute.

OCV of the battery. Multimeter set to max :

OCV =

OR

When emergency battery is used then type or write the resultant OCV of the batteries when connected in parallel with the battery which is fixed in the vehicle

Resultant OCV of the batteries. Multimeter set to max :

OCV =

12] Connect the battery to the vehicle.

13] Ensure that the gears are in neutral.

Do not use any accessory of the vehicle.

Do not press the brake, accelerator & do not steer the steering of the vehicle.

Do not switch ON any electricals of the vehicle.

Insert the key & keep the key in ACCESSORIES ON position for about 10 seconds, during this time few relays will turn ON & OFF, the fuel pump will turn ON & OFF.

Was it possible to hear the sound of the fuel pump [*note that the location of the fuel pump for few models of vehicles makes it possible to hear the sound of the fuel pump*] =

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After 10 seconds, only press the clutch & start the engine of the vehicle.

14] After 2 minutes, turn the key to only ACCESSORIES ON position for about 10 seconds & then remove the key.

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